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StatLab ANNUAL REPORT 2003/2004 Academic Year

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ECONOMICS**

StatLab Reports

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2003/2004 Academic Year

Statistics Program
Food and Resource Economics
University of Delaware

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College of Agriculture and Natural Resources

StatLab Annual Report 2003/2004

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INTRODUCTION

This report provides a brief summary of the role and services of the StatLab as well as a discussion of the activities of the lab in the 2003/2004 academic year. The Statistical Laboratory was designed for multiple purposes, including instruction of Statistics MS students and to provide a service for the statistical needs of campus and the region. Currently, there is no funding for the services of the laboratory other than funds provided by the Department of Food and Resource Economics. Hence one of our goals during this period was for the StatLab to be partly self supporting.

During 2003/2004 the StatLab assisted with 25 projects from 11 faculty, 12 graduate students and 4 outside clients. Of the 25 projects, six were funded and this income provided the yearly stipend of one graduate assistant. Three UD faculty included support for the StatLab in their grant proposals, and one of the grants received funding. We also started a collaboration with the newly established H. Graham Cancer Center of Delaware since they needed bio-statistical support. The StatLab is at a critical juncture in terms of larger, paying projects. On the one hand these projects will be important for the future growth of the StatLab. However, they often are time consuming and beyond the present resources of the StatLab staff. Within the next year the Department of Food and Resource Economics will need to invest in the StatLab if it is to continue to grow.

OVERVIEW OF THE MISSION OF THE STATLAB

The StatLab (Statistical Laboratory) was first established at the University of Delaware in 1983. In the Spring of 1997, the lab closed its operation. In 2000 the Statistics Program left the Mathematics Department and moved into the Department of Food and Resource Economics. As part of this move the graduate program in statistics was reestablished as was the StatLab at the Spring of 2002. The reported year was only our second full year since the move. The StatLab is jointly supported by the Statistics Program of the Food and Resource Economics Department and Research and Data Management Services of the IT-User Services.

The StatLab provides statistical consulting services to graduate students, faculty, staff, and researchers throughout the university, as well as non-University agencies and companies. The laboratory is staffed with a director and experienced graduate students.

During the 2003/2004 academic year, Lída Rejtő served as director, Ling Liu and Yanyan Li were the StatLab Graduate Assistants. The secretarial support was provided by Vicki Taylor. An advisory committee, consisting of university statisticians, research methodologists from various disciplines, and subject matter specialists from industry (see the list at the end of this report) provided additional support and guidance for StatLab activities.

The StatLab mission is:

- **Education:** to train students of the Statistics Program to interact effectively with investigators from a variety of disciplines
- **Research participation:** to enhance the quality of experimental and other research at the University by providing high-quality statistical advice
- **Collaboration:** to encourage collaborative research between statisticians and investigators from other disciplines both within and outside of the University of Delaware

Services of the Statistical Laboratory

The StatLab is designed to help researchers in the use of effective and appropriate statistical techniques in the analysis of data, including assistance in:

- **Research Design** – Assistance prior to conducting research
- **Statistical Analysis** – Assistance in methods for analyzing data
- **Statistical Computing** – Assistance in the selection of statistical packages and interpretation of statistical output

The StatLab is organized to provide easily accessible, high quality statistical consulting services to university graduate students, faculty, staff, administration, and outside units. The primary focus is to further the learning and research activities of our clients. The staff helps clients design experiments, analyze data and interpret results. They also assist clients with the statistical components of research and grant proposals.

Spring 2002 was the first time the StatLab was opened since 1997. In preparation for the opening of the StatLab, the Statistics Program wrote a mission statement, established policy, advertised on the UD Campus, and designed a web site with the relevant materials (<http://www.udel.edu/FREC/STATLAB/>). The Appendix contains the basic fact sheets for the StatLab.

RESULTS FROM THE ACADEMIC YEAR 2003/2004

During 2003/2004 the StatLab assisted with 25 projects from 11 faculty, 12 graduate students and 4 outside clients. We served 13 units from 5 colleges and two other units within the University of Delaware. We assisted in outside projects with Intervet Inc., the Helen F. Graham Cancer Center, the Delaware Health and Social Services, and the Environmental Alliance Inc.. We assisted four University of Delaware faculties with the statistical components of their grant proposal. In addition, the StatLab was included on grant proposals for four different projects, all with funding for the StatLab support. One of these proposals has already received funding and the other proposals are pending. We also prepared two research reports; one was "The Effect of Holidays on Hotel Revenues" for the project of Dr. F.J.Demicco (UD faculty) and one confidential report was submitted on the project of the Intervet company.

One of our main goals is for the StatLab to be self supportive, which means that services beyond initial consultation can no longer be provided free of charge. During this period we had

six paying projects which provided full year support for one graduate assistant. However if the StatLab is to grow and be fully self supporting, we anticipate needing at least one post doctorate student as a constant help for the Lab. During the reported period we were not able to take three more paying jobs partly because of the lack of knowledgeable staffing and partly because the research assistants had limited weekly availability. This is the biggest challenge facing the StatLab in the future.

Overview of 2003/2004 Projects

A wide variety of statistical techniques were used in the 25 projects in 2003 to 2004, including linear and nonlinear regression, design of experiments, principal component analysis, logistic regression, and time series analysis. Computer packages used included: SAS, S-Plus, Minitab and SPSS. A full description of the projects are listed in Table 1 below.

The most interesting projects were reviewed in the StatLab Review Session (STAT 641). This is a seminar-type class which is required for all statistics graduate students. The purpose of the seminar is two-fold. First, it provides an opportunity to teach students applications of statistics in real world situations with a range of clients. The StatLab Review Session also provides valuable input into the recommendations from the StatLab. Students, faculty, and industry statisticians all participate in the seminar and provide ideas and suggestions to the clients. As such, the session provides an excellent way to introduce our program and students to the surrounding community.

The following is a brief summary of some of the projects brought to the StatLab sessions.

One of the most interesting projects was brought to us by Professor F.J. Demicco from Hotel and Restaurant Management Department. The purpose of the research was to quantitatively examine the effect of holidays on hotel daily revenue based on daily revenue data of all US hotels from the last four years. A Generalized Additive Model with spline smoothing was used to examine the holiday effects controlling for the seasonal effect, weekday effect and a linear time trend. The analysis of residuals indicated that some holidays showed different patterns in their impacts on hotel revenues. For example, some holidays had a pre-holiday effect, some had a post-holiday effect, and others had both. Most interesting, certain holidays showed different or even opposite influences on revenue depending on whether they fell on a weekday or weekend. The detailed result of the analysis was published as a StatLab report (FREC SR04-01).

Another interesting project is came from Bill Doner, a graduate student in the Disaster Research Center. He is interested in the connection of human ecology and tornado morbidity. The question posed from this researcher was whether the number of people injured or killed during a tornado event was influenced by demographic variables of the regions. We suggested the use of logistic regression or Poisson regression to find connections among variables in the data set.

Eric Wommack, professor from Plant Sciences and DBI is came to us for help to examine the special and temporal dynamics of viral and bacterial communities in the Chesapeake Bay. Water samples were collected of nine stations along the Bay at five time points. Based on the samples the presence or absence of viral/bacterial bands were detected. Since the number of variables were more then the number of data points, we recommended compressing the bands and using principal component analysis to analyze the data.

Table 1: Summary of StatLab Projects from the Academic Year 2003/2004

| No. | Client | Department | Time | Project |
|-----|--|--|-----------|---|
| 1 | Andy Cosgrove | Intervet Inc. | 100 hours | Confidential. |
| 2 | Amir Gabr , Ph.D. student <i>Advisor: M.Emara</i> | Animal Sciences, College of Agriculture and Natural Resources | 3 hours | From genomics to proteomics. |
| 3 | Precharat Harvey, Ph.D. student <i>Advisor:R.S.Sharf</i> | Center for Canceling & Student Development | 15 hours | African American college students and the digital divide. |
| 4 | Nancy Schewada Nicholson UD Faculty | Linguistics Department, College of Arts and Sciences | 60 hours | The role of American English in Danish students' lives. |
| 5 | William Farquhar UD Faculty | Health and Exercise Sciences, College of Health and Nursing Sciences | 7 hours | Sympathetic-Osmotic interactions in humans. |
| 6 | Joseph Wysocki | Delaware Health and Social Services | 3 hours | Symptoms of depression in Polish and US university students |
| 7 | Pamela B.Stazesky UD faculty | Delaware Education R&D Center, CHEP | 3 hours | Studying effects of Delaware Mathematics Curriculum Implementation on student achievement. |
| 8 | Christie Jones M.S. student <i>Advisor: J.Swasey</i> | Longwood Graduate Program, College of Agriculture and Natural Resources | 20 hours | Motivation of public garden volunteers. |
| 9 | Lisa Cheffo UD Staff | Center for International Studies | 2 hours | International awareness and activity survey. |
| 10 | Frederick J. Demicco UD faculty | Hotel Restaurant Management, CHEP | 60 hours | The effect of holidays on hotel daily revenue. |
| 11 | Sharon L. Denney M.S. student <i>Advisor: R.Hampel</i> | School of Education, CHEP | 1 hours | Christiana High School students and staff perception survey data analysis. |
| 12 | William R.Donner Ph.D. student <i>Advisor: B.Aquirre</i> | Disaster Research Center, College of Arts and Sciences | 5 hours | Human ecology and tornado morbidity . |

| No. | Client | Department | Time | Project |
|-----|--|--|----------|---|
| 13 | Mengtao Guo M.S. student <i>Advisor: K.Manal</i> | Mechanical Engineering, College of Engineering | 2 hours | Analysis of data of patients with knee osteoarthritis. |
| 14 | William Farquhar UD faculty | Health and Exercise Sciences, College of Health and Nursing Sciences | 10 hours | Venous hemodynamic function in older hypertensive adults. |
| 15 | Eric Wommack UD Faculty | Plant Sciences, College of Agriculture and Natural Resources | 8 hours | Diversity and composition of viroplakton over an annual biological cycle of the Chesapeake Bay. |
| 16 | Rebekah Helton Ph.D. Student <i>Advisor: E.Wommack</i> | Plant Sciences, College of Agriculture and Natural Resources | 12 hours | Assesment of sample processing methodologies for investigation of sediment viral ecology. |
| 17 | Jaehee Jung UD faculty | Consumer Studies, CHEP | 4 hours | The effect of media images on mood and body image. |
| 18 | Eugene Matusov UD faculty | School of Education CHEP | 3 hours | Teaching imaginary children. |
| 19 | Raelene E.Maser, UD faculty | Medical Technology, College of Health and Nursing Sciences | 5 hours | Analysis of automatic nerve dysfunctions of patients with cardiovascular disease. |
| 20 | Jason Mills Ph.D. student <i>Advisor: R.M.Dyer</i> | Animal Science, College of Agriculture and Natural Resources | 4 hours | Time course study of mRNA expressions in bovine laminae. |
| 21 | Christopher M. Modlesky UD faculty | Nutrition and Dietetics, College of Health and Nursing Sciences | 5 hours | Optimizing bone health in children with cerebral palsy. |
| 22 | David Morgan | Environmental Alliance Inc. | 3 hours | Demonstrate attainment of cleanup standard for a monitoring well. |
| 23 | James L. Morrison UD faculty | Consumer Studies CHEP | 1 hours | Jamaican economic literacy survey. |
| 24 | Vikas Agarwal, Ph.D. student <i>Advisor: B.Meyers</i> | Plant Sciences, College of Agriculture and Natural Resources | 2 hours | Comparison of large scale gene expression technology. |
| 25 | Robert L. Witt | H.Graham Cancer Center | 4 hours | Comparing facial nerve distances in live patients and cadavers. |

TABLE 2: LIST OF PROJECTS BY UNIT, Academic Year 2003/2004

| University/Outside Units | Client Requests |
|--|------------------------|
| College of Agriculture and Natural Resources | |
| Animal and Food Science | 2 |
| Longwood Graduate Program in Public Horticulture | 1 |
| Plant and Soil Sciences | 3 |
| College of Arts and Sciences | |
| Disaster Research Center | 1 |
| Linguistics | 1 |
| College of Engineering | |
| Mechanical Engineering | 1 |
| College of Health and Nursing Sciences | |
| Health and Exercise Sciences | 2 |
| Nutrition and Dietetics | 1 |
| Medical Technology | 1 |
| College of Human Services Education and Public Policy | |
| Consumer Studies | 2 |
| Delaware Center for Teacher Education | 1 |
| School of Education | 2 |
| Hotel Restaurant and Institutional Management | 1 |
| Center for Counseling and Student Development | 1 |
| Center for International Studies | 1 |
| Outside Clients | |
| Intervet Inc. | 1 |
| Helen F. Graham Cancer Center | 1 |
| Delaware Health and Social Services | 1 |
| Environmental Alliance Inc. | 1 |
| Total | 25 |

Costs of StatLab Services

The Statistical Laboratory was designed for multiple purposes, including instruction of Statistics MS students and to provide a service for the statistical needs of campus and the region. Currently, there is no funding for the services of the laboratory other than funds provided by the Department of Food and Resource Economics. The goal of the StatLab is to provide free consultation services for up to two visits. However, users are encouraged to pay for services if they have funds available and are required to pay for and consultations that go beyond two visits or require analysis by the staff of the StatLab. These stipulations are included in the Request for Statistical Consulting form (see Appendix).

During the 2003/2004 academic year we estimate a contribution of 1,333 person hours from the Director and the Graduate Students to project analysis, meeting with clients, writing reports, and conducting seminars. The department contributed the graduate assistantships, a computer, printer, and software, and additional resources totaling approximately \$28,000. The breakdown of this effort is given in Table 3.

Table 3: Person Hours Contributed to the StatLab, Academic Year 2003/2004

| | |
|---|-------------|
| Hours of operation (2 x a week, 4 hrs each) | 224 hours |
| Director's time | 224 hours |
| Additional Graduate Student Time | 283 hours |
| Seminar Time | 260 hours |
| Projects | 342 hours |
| | ----- |
| TOTAL | 1,333 hours |

We are especially pleased to assist users with the preparation of the statistical components of grant applications. This semester four of our clients included StatLab support in their grant proposal, and we had three UD and one outside client who paid for our services. We believe that grants will provide a significant source of future revenue to the StatLab. We believe a well-planned statistical design and outline of the analytic procedures could increase the chances of funding a grant proposal.

We continue to investigate the possibility of closer ties with other companies in the nearby area. We also continue to investigate the possibilities of joint grant proposals with the other colleges and departments within the University of Delaware. For example, Dr. Rejto started a collaboration with the newly established Helen Graham Cancer Center of Delaware which needs biostatistician support for their research. Dr. Rejto now serves on the Protocol Development Committee for the Helen F. Graham Cancer Center of Delaware.

ACKNOWLEDGMENTS

The Director appreciates the strong support and help of Thomas Ilvento, Chair of the Food and Resource Economics Department. Without his help we would not be able to provide this service. The Director acknowledges the assistance of Dick Sacher and Larry Hotchkiss of Research and Data Management Services of the IT-User Services. The Director acknowledges the assistance of the Advisory Committee, who provides a variety of extra assistance for our clients (see Table

4) especially acknowledge the invaluable help of Diccon Bancroft and Mike Free. The Director highly appreciates the help of Vicki Taylor. Her patience taking the phone calls of the clients and organizing the schedule of the StatLab was an important component of our successful work.

TABLE 4: STATISTICAL LABORATORY ADVISORY COMMITTEE, ACADEMIC YEAR 2003/2004

Bancroft, Diccon, M.S. Yale University; Statistician, W. L. Gore & Associates, Statistical applications, experimental design, and survival analysis.

Eggermont, Paul, Ph.D., SUNY Buffalo; Associate Professor, Statistics Program, FREC Department, Nonparametric estimation, statistical computing, regression.

Free, Spencer M., Jr., Ph.D., North Carolina State University; Biostatistics Consultant.

Gorman, R., Ph.D., University of Delaware, Statistical Consultant, regression methods, design, goodness-of-fit.

Ilvento, Thomas, Ph.D., Pennsylvania State University; Chair and Professor, FREC Department, regression methods, survey methodology, social demography.

LaRiccia, Vincent N., Ph.D., Texas A & M University; Associate Professor, Statistics Program, FREC Department, Goodness-of-fit, parameter estimation and testing, order statistics, EDA, and regression.

Mason, David M., Ph.D., University of Washington-Seattle; Professor, Statistics Program, FREC Department, Goodness-of-Fit, order statistics nonparametric statistics, time series.

Pesek, John D., Ph.D., University of Michigan; Associate Scientist, Statistics Program, FREC Department, Agricultural statistics and design of experiments, and analysis of variance.

Sacher, Richard, Ph.D., Stanford; Manager, Research and Data Management Services of the IT-User Services. Scientific Computing, statistical computing, mathematical optimization, linear and non-linear regression.

Schiffelbein, Paul, A., Ph.D., University of California, San Diego; Statistical Consultant, QMTC DuPont Engineering, experimental design, EDA, statistical process control, regression analysis.

Thorpe, Daniel, Ph.D., University of Wisconsin, Madison; Statistician, W. L. Gore & Associates.

APPENDIX

Documents and Policy Connected with
the StatLab, Academic Year 2003/2004